

Designing Transferable Skills Inventory for Assessing Students using Group Discussion: A Case Study of First Year Electrical and Electronics Engineering Students

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Abstract

Employability skills among engineering graduates have been a concern due to their inability to perform on a professional platform to the employer's expected level. As they are higher cognitive skills, they are to be nurtured during the graduation period. Keeping this in view, group discussions are identified as one of the methods to elicit leadership, problem solving and communication skills among the student community. The present study also gives importance to peer assessment as a part of collaborative learning.

Keywords: Transferable skills, group discussion, employability skills, problem solving and conceptualization

1. Introduction:

In an era of continuous knowledge and technological revolution where information is just a click away, it is very important to critically evaluate the concepts learned to apply for developing defined and sophisticated applications. Imparting knowledge to the student in an active learning environment has led to many innovative teaching methodologies by increasing flexibility and supporting new types of learning activity¹⁻³. Among various learning environments, collaborative learning is more student-centric as it demands their active participation^{4,5}. In the present study, group discussion involves collaborative learning and various transferable skill components that can be tested and improved during a semester so as to enhance their employability skills. Employers persistently seek graduates with a range of transferable skills apart from their expertise in the core discipline⁶⁻⁸. Hence, in academics, it is very important to develop and articulate new skills relevant to meet the requirements of the emerging opportunities in various fields of science and technology. The training that is imparted to the students should prepare them both physically and practically to transform them into employable youth. The present study focuses on disseminating transferable skills along with knowledge pertaining to science and technology in a collaborative manner. The objective of this paper is to assess the students' transferable skills over a period of time through their performance in group discussions.

2. Methodology:

Any classroom consists of a heterogeneous combination of students from diverse backgrounds. Facilitators need to know the students' level of understanding and articulation so that they can effectively guide the students towards the learning objectives of the course. Group discussions are one of the methods to gauge the students' strengths and weaknesses at various levels of the transferable skills and guide them towards improvement. The aim of this study is to steer the students gradually towards gaining the necessary transferable skills and apply the concepts learnt at a macro level.

The criteria for evaluation for each individual was done on a scale of 1 to 5, 5 being the maximum marks for the various components in the rubric given in appendix A. The individuals' performance in the group discussion was evaluated according to the scale. The group score was calculated by adding up the scores of the individual members.

In the initial stage itself, all the members of the group are motivated to participate actively to hone their leadership qualities. The role of the facilitator in the group discussion was outlined right at the beginning to all the participants by the authors. Facilitator directed the students towards acquiring transferable skills that are necessary to adapt theory into practice. After each group discussion, participants were made aware of their difficulties and advised to work on their shortcomings. The first group discussion was an icebreaker warm-up exercise and hence spontaneous topics were selected. For the second and the third group discussions, the topics were given one week beforehand to enhance their performance.

Developing a rubric:

Computational skills and the ability to see concepts as abstract for applying them in a real world context is a difficult process for students^{9,10}. Generally, group discussions have seemingly different outcomes depending on the core domain knowledge in which it is taking place. Student assessment is to be done in a methodical way so that they are appropriately associated with the outcomes of the course. So, the evaluation rubric should be developed based on the core domain, with the required generic skills integrated within. An inventory in the form of a rubric is developed for group discussion that takes into consideration the various aspects of focused outcomes. The evaluation parameters are informed to the participants in advance. This helps in carrying out the

process of group discussion without deviating.

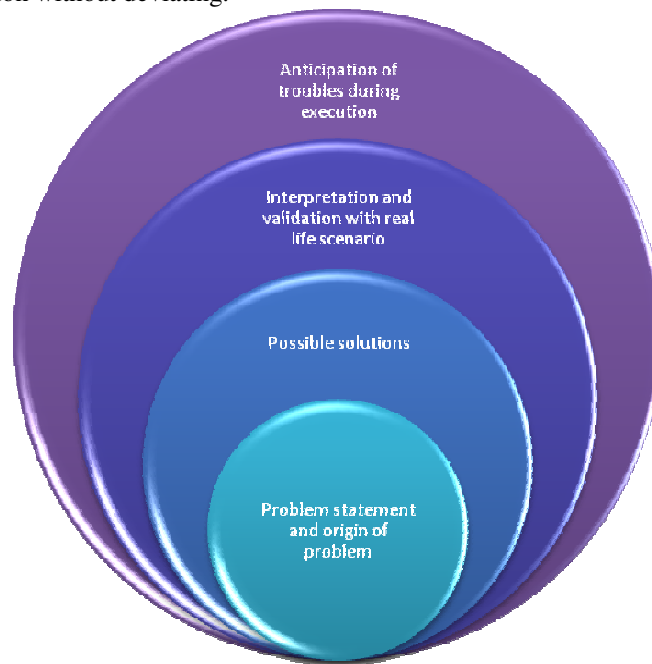


Fig.1: Illustration of various stages in the group discussion

During the various stages of group discussion (Fig.1), the student is assessed using the rubric that is developed by incorporating the components, (1) Leadership and persuasive skills, (2) Problem solving and conceptualizing skills, and (3) Communication and interpersonal skills. These in turn are categorized into related sub components as illustrated in fig.2.

	<p>Leadership and persuasive skills</p>	<ul style="list-style-type: none"> •Ability to lead and inspire •Seeing problem in multiple perspectives and ability to convince
	<p>Problem solving and conceptualizing skills</p>	<ul style="list-style-type: none"> •Ability to think innovatively and creatively understanding the situation •Analytical ability and application to the macro level
	<p>Communication and interpersonal skills</p>	<ul style="list-style-type: none"> •Presentation, articulation, sharing •Ability to interact and emotional maturity

Fig.2: Diagram depicting the components in the rubric

In the present case study, the 1st year Electrical and Electronics Engineering stream of GITAM University, Hyderabad campus are the participants. The first task was forming groups among the students who belonged to diverse economic, social and cultural backgrounds. As we are dealing with a large section of 66 students initially, the entire strength is divided in two halves, A and B. A and B groups are further divided into eleven small groups, each group comprising six members.

In the first round, when the group discussions are carried out in A, B group members act as peer group assessing group A and vice versa. Key points of the discussion, active and passive members of the group, most innovative aspect mentioned and the final outcome are the points to be noted by the peer assessing group.

2.2 Work flow

Problem solving and communication skills are crucial elements in the employability of a student. Engineering students need to be creative, questioning, analytical, and detail oriented. Planning, designing and implementing in various domains^{11, 12} taking the theory to practice is a part of their career. Ability to work in a team,

communication skills and interpersonal skills are increasingly important as engineers regularly interact with professionals in cross disciplines¹³. As a part of this, collaborative and peer learning strategies are mixed in the present approach to impart a range of transferable skills and core discipline skills. In the real world context, an engineer has to present the solution that is amicable to various groups like social, economic and environment. Group discussions on select topics play an important role in imparting such skills in bridging the gap between theory and practice. Four group discussions were held for all the groups present in A and B, where the first group discussion was an icebreaker. Select topics were chosen depending on the objective of each group discussion. The first group discussion helped them to get acquainted with each other. In the second group discussion, the difficulty level of the topics was increased to identify a leader among the group. Team work, communication and problem solving skills were focused in the third one. In the fourth one, the same skills were focused arriving at metacognition level.

3. Results and Discussion

When diverse minds are at work, various facets of the problem and wide range of solutions are displayed. In fact, a knowledge base is created that can be used in apt situations. In situ, generation of ideas is observed when the discussion is channelized properly.

The first group discussion was a bit stressed as the students were apprehensive due to various reasons. Based on the rubric assessment, it was observed that teams lacked in leadership skills. In some groups, it was noticed that they were unable to analyze the problem. Some groups deviated from the topic as the discussion progressed. After the second group discussion, the facilitator apprised the class of the outcome and what is expected from the teams. Also some common points on which the teams should work to perform better in group discussions were discussed in the class.

For the third group discussion, the comfort levels among the team members were higher compared to the first and second ones as they knew their team members and their strengths and weaknesses. The team members were eager to discuss the topic as they were given a chance to pick up a topic in which they were interested. Now that they know their strengths and weaknesses, they became responsible and mature enough and encouraged the passive members to become active.

In the fourth group discussion, the teams were directed to pick up a socio-relevant problem related to their hometowns and discuss, leading to a solution. As most of the students belong to Hyderabad, the topics also are related to the Hyderabad city and surrounding rural regions like traffic jams, water problem, pollution, cost of living etc. The team members actively discussed for about 20 minutes and identified the problem they would like to represent. The level of maturity in the students was reflected in the manner they let go off their egos and allowed the capable persons in their teams to take up defined roles. Each team was given fifteen minutes to represent their group. Some of the groups were still unable to manage the time in a balanced manner to present their views. Four groups came up with innovative solutions and among these, three groups organized time in an appropriate manner.

Performance of the students during the group discussions is presented in table 1.

Table 1: Performance of the students during group discussion.

Groups	G 1			G 2			G 3		
	leadership and persuasive skills	communication and interpersonal skills	Problem solving and conceptualizing skills	leadership and persuasive skills	communication and interpersonal skills	Problem solving and conceptualizing skills	leadership and persuasive skills	communication and interpersonal skills	Problem solving and conceptualizing skills
A1	34	48	0	44	57	2	51	48	5
A2	47	56	4	39	49	2	43	49	6
A3	42	53	2	42	43	0	45	61	3
A4	25	25	0	25	47	0	30	35	0
A5	45	45	0	48	60	4	48	51	8
A6	25	25	0	25	50	0	34	44	0
A7	34	47	0	35	52	0	45	59	9
A8	25	25	0	25	35	0	29	35	0
A9	41	45	0	45	60	4	46	57	8
A10	39	45	0	48	55	0	45	39	1
A11	42	37	0	48	58	2	51	61	4
A12	56	58	0	59	63	6	64	68	12

4. Conclusions

The authors of this study felt that the students could gain new knowledge and skills in an interesting manner while working as a group. The students also appreciated the role of the instructor as a facilitator rather than as a typical teacher who is in complete control of the class. The transferable skills that were learnt during the group discussions can be very helpful in networking and collaborating with others in technologically mediated environments later in life.

Students learned how to work in a team towards a goal. The components present in the rubric helped them evolve as mature and responsible persons who could take the responsibility of their learning. They could understand the importance of working as a team for success.

There were some unexpected outcomes of the group discussions where two students who completed their task went on to help other members in other groups. Also a student who appeared to be disinterested in classroom activities was noticed to be keenly involved in poster presentation activity.

The unforeseen setback of this study was the dwindling interest in some students. Majority of the students in engineering come from the environment where they are taught to study from the examination point of view. As this study is not the part of the course curriculum, these students did not put in much effort.

To conclude, the study asserts that the main stress of the educational institutes should be on imparting employability skills and core domain skills nurturing industrially related talents giving rise to global leaders with a vision.

Acknowledgements:

The authors are thankful to B. Tech I year students of Electrical and Electronics Engineering branch (2011- 12) of GITAM University, Hyderabad, Andhra Pradesh for their commendable cooperation throughout the study.

APPENDIX A:

A1 GROUP

		Leadership skills			Communication skills			Interpersonal skills		Persuasive skills		Problem solving skills		Conceptualizing skills	
		Lead	Inspire	Responsibility in attaining group objective	Clarity of thought	Apt language	listening	Ability to interact	Emotional maturity	Ability to see the problem in multiple perspectives	Convincing	Ability to come out with innovative and creative solutions	Analytical ability	Grasping situation	Application to macro level
11	G1														
	G2														
	G3														
	G4														
12	G1														
	G2														
	G3														
	G4														
13	G1														
	G2														
	G3														

APPENDIX B:

Prior to the group discussions, the students were informed, that the topics given or chosen for the group discussions need to provide a solution using science and technology to bring out insight of applying knowledge to the real life scenario in the students.

The topics given for the first group discussion were related to improving our environment like (i) Methods to reduce plastic usage in our daily life, (ii) Necessity of mobile phones on the campus, (iii) Parents' pressure in students' lives regarding their choice of career, (iv) Air pollution and its preventive measures, (v) Internet – a substitute to education or not, (vi) Effect of movies on present generation, (vii) A perspective on present day education system – Remedial measures, (viii) Pollution control, (ix) Corruption, and (x) Ragging in professional colleges.

The topics given for the second group discussion were (i) Natural resources available in Andhra Pradesh, (ii) Terrorism in India, (iii) Depletion of Ozone layer, (iv) Groundwater shortage in Andhra Pradesh, (v) College life in Andhra Pradesh, (vi) Global warming, (vii) Green revolution, (viii) Rain water harvesting, (ix) Corruption in Indian, and (x) Social networking sites – Advantages and disadvantages.

Socio-relevant issues prevalent in their native places and their remedial measures were chosen as topics for the third group discussion. Problems related to hygiene, caste politics, scarcity of drinking water, fluorosis, sanitation, lack of schools, transport and medical facilities, need of scientific awareness among farmers, child labour, and unemployment were discussed.

The fourth group discussion also consisted of a poster presentation along with the group discussion. Students chose the following topics: the public health (tobacco, drugs, sanitation and organic farming), waste management, eco system, Plastic-the earth crusher, and environment – our future for poster presentation.

APPENDIX C

Photographs of participants of the group discussion and the authors



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